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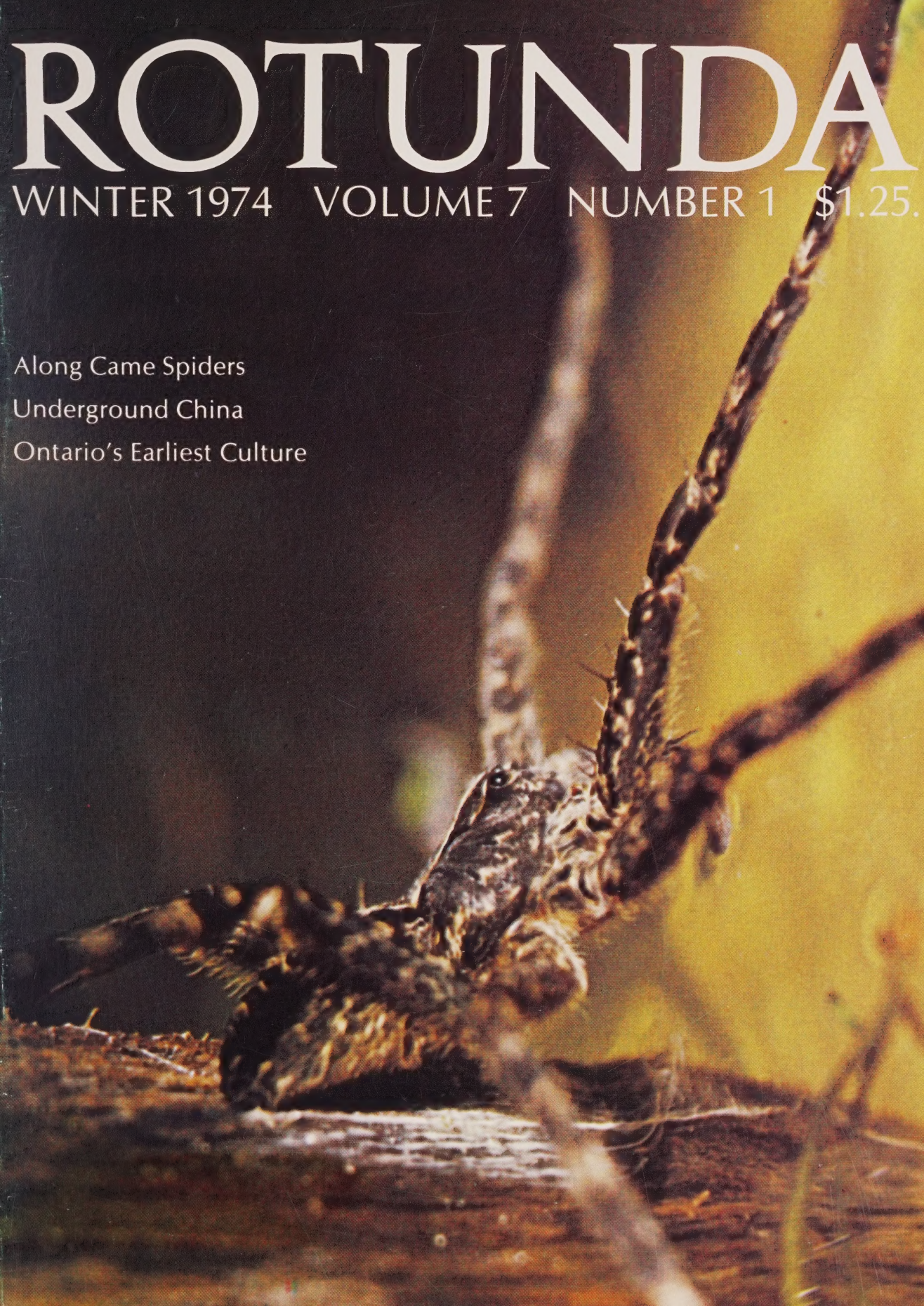

Along Came Spiders

Underground China

Ontario's Earliest Culture

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ROTUNDA

the magazine of The Royal Ontario Museum
Volume 7, Number 1, Winter 1974

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On footprints

A. G. Edmund *Vertebrate Palaeontology*

One hundred and seventy years ago a farm boy discovered three-toed footprints in the rock near his home in the Connecticut River valley of Massachusetts. Originally thought to be the tracks of giant extinct birds, the footprints were eventually recognized as having been made by smallish dinosaurs which lived about 200 million years ago. At that time, the area was a broad floodplain, with many muddy areas. Conditions were excellent for the preservation of not only footprints but even the tiny craters left by raindrops and the cracks caused by the mud drying in the sun. These markings were gently covered by successive layers of sediment and eventually turned into rock.

Most of the trackways were collected many years ago, especially by Amherst College, and are now relatively scarce. The ROM was fortunate recently in purchasing from Princeton University two large slabs showing the clear imprints of several species of dinosaurs.

One of the slabs will soon be displayed in the introductory area of the hall of Vertebrate Evolution.

Unfortunately very few skeletons have been found associated with the footprints, and the footprints were given a wide variety of names, depending on size, shape, presence of claw-imprints, etc. Modern research has been able to associate the various footprints with known species of dinosaurs, using information such as the structure of the foot bones, length of stride and relative heaviness of the animal.

The large footprints (measuring 15 inches in depth) have been named *Eubrontes*, and represent a heavily built flesh-eating dinosaur. The foot structure and trackway pattern indicate an animal weighing up to 1000 pounds, with a length of 20 feet. The smaller footprints, named *Grallator*, are six inches long, and belong to a lightly-built coelurosaur about eight or ten feet in length. Because of its hollow air-filled bones, this type of dinosaur may not have weighed more than 50 pounds.

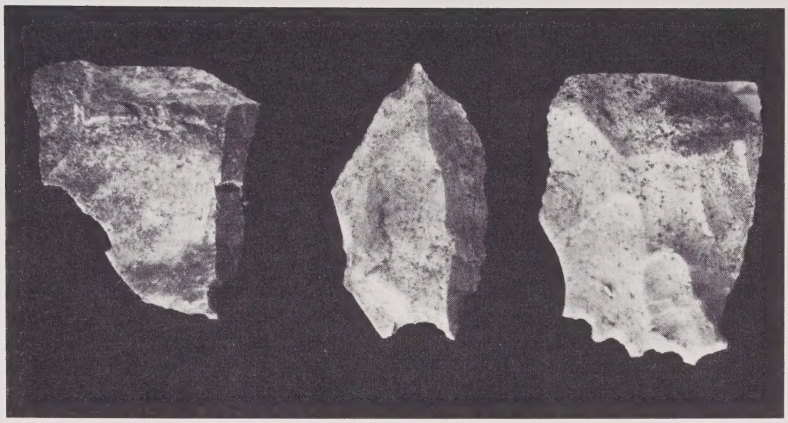
The Barest Trace

New Developments in the Search for Early Man in Ontario

Peter Storck

Some 13,000 years ago, all of northern Ontario and much of the central part of the province was deeply buried beneath several thousand feet of glacial ice. Only part of south-western Ontario was ice-free, existing as an island bordered on the north and east by the ice mass, and on the west and south by large glacial lakes overflowing the Huron and Erie

Early Man in Ontario probably hunted barren ground caribou with spears tipped with fluted projectile points. Painting by Paul Geraghty.



The three gravers, engraving tools with delicate spurs, and the two fluted projectile points, intended as spearheads, found near Alliston, Ontario. All are 1½ times actual size. These tools were made by Early Palaeo-Indian hunters who may have camped in the area between 9,000 and 12,000 years ago.

basins. However, by 12,500 years ago the continued wasting and retreat of the ice sheet opened new outlets to the lakes, causing their levels to drop and exposing land bridges between southern Ontario, Michigan, and New York. Soon after this, small bands of hunters moved into the tundra and boreal forest landscape of southern Ontario, their first footfalls sounding the beginning of man's prehistory in this province.

Known as early Palaeo-Indians, these people brought with them a very distinctive type of stone spearhead—the so-called fluted projectile point. This is a small leaf-shaped point from two to five inches long. Characteristically, a long flake was removed from each face of the point creating shallow U-shaped grooves or channels which served to thin the point so that it could be hafted onto a spear. Approximately fifty or so points have been reported from southern Ontario to date but these are all isolated surface finds picked up from ploughed fields. Somewhat surprisingly perhaps, not a single early Palaeo-Indian campsite had been discovered in the province, at least prior to the summer of 1973. Since every fluted point offers the promise of leading directly to a site, newly discovered specimens should be reported to an archaeologist immediately. Even if such a point proves to be an isolated find, it can provide useful information concerning the distribution of such points and thus suggest specific areas where we might most profitably look for sites.

About a year ago, Mr. Charles Garrad, an appraiser by profession but also an enthusiastic student of Ontario's prehistory, heard of two fluted points found by a farmer in the Alliston area. He immediately arranged to visit the farmer and was surprised to learn that the points had been found eleven years apart in the same general area, one near the top of a sand ridge and the other near its base.

Map of part of southern Ontario at the end of the Pleistocene or Ice Age. The fluted points, gravers, and other tools found on a sandy ridge in the Alliston region may have come from one or more campsites occupied by Early Palaeo-Indian peoples between 9,500 and 11,500 years ago. During most of this interval, the ridge was either a small offshore island or a peninsula jutting into a shallow bay of glacial Lake Algonquin, and a small number of families may have camped on or very near a beach offering an excellent view of the surrounding terrain. The lake, indicated by a dark solid line, is shown on the map as it would have appeared in the middle part of its history with Manitoulin Island and all of Ontario north of Lake Simcoe being buried beneath glacial ice. As the margin of the ice sheet continued to retreat northward, the lake grew larger in size (indicated by the dark broken line). It drained first through an outlet at Kirkfield, ultimately reaching glacial Lake Iroquois (the antecedent of Lake Ontario), and later through an outlet south of North Bay into the Mattawa and Ottawa rivers.

Work in progress at the excavation site on the sandy ridge in the Alliston region where the gravers and spearheads were found.

I later talked to Mr. Garrad about the fluted points and he told me that because the points were found so close together he thought that there was a good chance there was a site nearby. Since he hadn't as yet arranged to follow the lead any further, I agreed to visit the area to see if test excavations or at least a more thorough survey should be undertaken.

My first view of the area certainly gave me a turn. Mr. Garrad had told me that the two points were found on and near a sandy ridge which might have been a peninsula on an Ice Age or Pleistocene lake. I was unprepared for how clearly this was to be seen! Even before I had located the farm, I could plainly see in the distance where the artifacts had been found because of the prominence of the ridge on the broad flat plain of the former lake bottom. This was exactly the type of situation where Early Man is known to have camped in the Great Lakes region, and I had a good many visions in my head of what we might find when I turned into the laneway to the farm.

There is no question about the identification of the points. The larger of the two is a particularly good example of a fluted point showing the leaf-shaped or lanceolate outline, the concave base, and the rectangular flute scars. The point was made of pinkish-white chert, a material not unlike flint, and has a single flute scar on each face. The other point was made of reddish-brown chert and has a short flute scar on only one face, the opposite side being unfluted.

The farmer had also found chipping debris and other artifacts on the ridge but the latter are not, with one possible exception, distinctive enough to identify the people who made them. At first glance the single exception is only a discarded flake. However, a closer look reveals a very small but sharp point on one side of the flake which was deliberately made by very careful chipping. This is known as a graver, and since this type of tool came to preoccupy us during our work at the site I should say a few more words about it. Gravers were made on waste flakes and several types of tools, and may have from one to several small points a few millimetres in length. These short points, or spurs as they are also known, were always made by removing flakes from only one face of the artifact. Consequently, gravers are easily recognized and distinguished from other types of tools. Their exact function is unknown, but it is unlikely that they were used as drills because of the small size of the spurs. Most likely they were used for engraving designs in wood or bone, for piercing skins or other pliable material, or possibly even for tattooing. However, what is most important for our purposes here is the fact that gravers occur on early Palaeo-Indian sites across North America, sometimes in great numbers, and therefore seem to have been important in the tool kit of these early hunting peoples.

A single fluted point, of course, could have been lost by a passing hunter, or carried some distance by a wounded animal. Two such points and a graver—an artifact which one would expect to be associated with camping activity rather than hunting—from the same general area is a suspicious coincidence. If this was, in fact, a fluted point site it would be the first to be discovered in Ontario (or at least one of the first, depending on the success of another archaeologist also look-

ing for Early Man sites that same summer) and could tell us a great deal about the earliest people to have occupied the province. I wanted to begin work right then and there. Unfortunately this was not possible because the field had already been planted so I made arrangements to do some testing later that summer after the hay crop had been harvested.

I returned to the site on August 2nd with a small crew and we immediately tramped the length and breadth of the eight-acre field on top of the ridge collecting and recording the location of all of the flakes and artifacts we could find. This information would help us later in placing our test squares in the best possible areas. Almost immediately one of the crew found a multiple-spurred graver with five minute points. We had also found two areas, each thirty or forty feet in diameter, containing dark charcoal-stained soil and fire-fractured rocks. Needless to say, spirits were high while we staked out the grid system and started digging the first squares.

Thus began on a high note two weeks of continuous work during which it sometimes seemed as though we were chasing ghosts. The features proved difficult from the start. In two separate areas, we uncovered numerous pits of various shapes and sizes filled with dark soil and fire-cracked rock. They were certainly areas where fires had burned but most were empty and only a few contained a stray flake or two. Because of this and their highly irregular shapes it is difficult to interpret them as hearths. They could be the result of tree-burning during land clearance, but if this is the case I would have expected to find such burned areas over most of the field rather than at one end. I have inadvertently excavated animal burrows, root channels, and tree-throws before, but these features still puzzle me.

Elsewhere in our excavations we were finding the occasional unfinished or broken tool and small numbers of flakes, but no diagnostic tools; nothing that could tell us whether or not Early Man had actually camped here. It was encouraging, of course, not to find artifacts made by later peoples, but then I hoped that our work would produce more than negative evidence of this sort!

Finally, about half-way through our work we found another multiple-spurred graver, this one from the very centre of the ridge where we had also found numerous flakes and fragments of tools. I immediately started more extensive work in this area and we found a small concentration of material and the remnants of several sub-surface pits extending below the plough zone. This was apparently a small occupation area, but again we found no artifacts that were any more diagnostic than the graver and which would allow us to state categorically whether this was an early Palaeo-Indian camp or not. On the last day of our work, we found yet another graver, this one with a single point. While I would have preferred to find a fluted point, this graver did strengthen my feeling that we had actually found an Early Man camp. Furthermore, the occurrence of remnants of features below the plough zone suggested that other tools and possibly even burnt bone might still survive in an undisturbed context. While we have only the barest trace of Early Man, we found enough material to justify our return next summer on a longer and more extensive excavation project. Other areas of the sand ridge need to be tested, and we might yet find the evidence we need to reconstruct some aspects of the lives of these most ancient of people to have lived in Ontario.

Peter Storck was born in southern Wisconsin in 1940. He received his B.Sc. in 1963, his M.Sc. in 1967, and recently his Ph.D., all three from the University of Wisconsin, Madison. He has extensive training in natural sciences, including geology. He has done yearly field work since 1960 on archaeological sites ranging in age from 11,500 to 600 years ago, and varying in location from southern Alaska to Central Mexico. In the fall of 1969 he joined the staff of the ROM, where he is Assistant Curator in the Office of the Chief Archaeologist. For the past four years he has been involved in intensive site surveys and excavation work in northern and southwestern Ontario.

Creepy, Crawly, Hairy, Eight-legged and Beautiful

In Defense of Spiders And Their Strange Ways

Pandora Buckley

Two members of the Araneidae family, noted for the bright colours and intricate patterns on their abdomens. (Photos W.A. Crich)

I always say "Good morning" to the two live Tarantulas we keep in the Department of Entomology. It's a good way to start the day— and they have been here for more than two years. One particular morning last summer, I looked into the first aquarium and said hello, then into the second one. Empty! No Tarantula to talk to! Within seconds I had gone through all the possible implications of this situation, from a guard squashing her underfoot, to screaming headlines — "Deadly tarantula loose at the ROM!"

She's not deadly, of course. It she did bite someone, which would be a rare occurrence, it would cause only pain — no convulsions, no death. It would have been a tragedy to lose her by a careless step, so I quickly searched the room and there she was, ten inches away from her residence, hiding in a corner. She was easily coaxed back into her home, expressing her objection to being disturbed by flicking a few hairs off her abdomen — a habit with some tarantulas.

Spiders! What does that word conjure up? Revulsion? Interest? Next to bats, snakes and wolves among the most maligned and feared of creatures, spiders deserve none of their evil reputation. Their activity is an integral and beneficial part of our world. Over many hundreds of years they have played contrasting roles in folk tales, in nursery rhymes and in our imagination, all related to the unsurpassed skill and beauty of their weaving as well as to an irrational fear of their venom and their "creepyness." Man has long believed that spiders can serve practical purposes — in eliminating noxious insects, in foretelling weather, and for medicinal purposes — and their place in both literary lore and biological literature is longstanding.

The ancient Greeks explained the origin of spiders in the legend

A Jumping Spider: he depends on his hunting abilities for food, first stalking his prey and then leaping upon it. On facing page, a North American species of the Tarantula. (Photos T. Yamamoto)

of Arachne, a girl renowed throughout Lydia for her great skill in weaving. According to Ovid, birds came to watch, and brooks changed their courses to get a glimse of her work. Unfortunately Arachne became proud and arrogant, even claiming that she could outdo Athene, the Goddess of Wisdom and Art. Athene became so annoyed that she accepted Arachne's bold challenge to a weaving contest. Both produced tapestries of extraordinary beauty, but Athene recognized that Arachne, an ordinary mortal, probably had the edge. The goddess flew into a rage, tore Arachne's work to shreds and so vented her anger on the poor girl that she was driven to hang herself. But Athene did not let her die. She changed her into a spider, to produce her own silk and spin forever.

The Middle Ages had its share of spider lore too. In the 15th and 16th centuries arose Tarantism, a local phenomenon associated with spiders. From southern Italy it spread north, covering all Italy and moving into Spain by 1650, thereafter fading rapidly. Tarantism is the name given to the alarming effects alleged to follow the bite of a harmless Wolf Spider common in the areas mentioned. The "poison" could only be counteracted by music and dancing—prolonged dancing, which had to be vigorous and generally slightly vulgar. Various writers have since put forth an explanation: when the introduction of Christianity abolished public exhibitions of heathen rites, the priestesses of the god Bacchus could no longer openly conduct the orgies of that god, and devised the spider-venom story to cover their indulgences.

Fugitives of historic fame have allegedly been aided in their escapes by spiders. David is said to have escaped King Saul by sheltering in a hiding place,

across the entrance of which a spider then fortuitously spun a web. Pursuers, seeing the web, were convinced that no one had entered. Mohammed also escaped his enemies in this fashion.

Some superstitious people regard a spider as the bringer of good luck — such as the burglar who had several spiders tattooed on his forehead to bring luck to his nightly ventures. And the money spider (Zebra Spider) is supposed to be the herald of good luck if found on your clothes. There is a folk saying,

If you want to live and thrive
Let a spider run alive.

From West Africa comes the clever Anansi, the spider who lives by his wits. Tales of this funny and lovable rascal are used by the Ashanti to teach a wide variety of lessons in an extremely witty and entertaining way. Our twentieth-century folklore contains Shelob, a giant monster in spider form who lived in a great mountain and lured her victims into its dark evil-smelling labyrinthine passages. She was subdued by Frodo, the hobbit, in J.R.R. Tolkien's "The Lord of the Rings."

Spiders have long been recommended and used as a cure for a host of ills, from earache and periodic female complaints to rheumatism and gout. Webs were used to staunch the flow of blood from wounds as early as the 1st century A.D. As late as the 18th century, the House Spider (Tegenaria) was taken to cure malaria and other fevers. Doctors also prescribed spiders lightly covered with bread, wrapped in a raisin, or spread on bread and butter, to be taken internally. A certain Dr. Thomas Muffet who lived in England about 300 years ago was a well known naturalist with a great liking for spiders. He used them for medicine and kept them about the house. Was his daughter the Little Miss Muffet of the nursery rhyme?

In more recent times, strands from webs have been used for cross-hairs in optical instruments and range finders, and in telescopic gun and bomb sights.

Many people enjoy watching a spider spin its web, or stalk its prey, yet fear of spiders is common. Is it because of their stealth and agility, the thought of a venomous bite, or the unnerving experience of walking face-first into a web, particularly at night? Perhaps it is dread of contact with the hairy claw-armed legs. True, spiders are not exactly prepossessing, but many have the most colourful and intricate markings found in the animal kingdom.

Is it poisonous? Will it bite? Both questions are easily answered. Yes, spiders are poisonous — to their prey, but in most cases, not to humans. Spiders have fangs with which they seize their prey and through which the poison is injected. The victim lapses into a coma from which it never recovers. However, very few spiders have fangs capable of piercing human skin and, of those that can, most do

Black Widow, male, more colourful than the female which has colour only on the underside of her abdomen. (Photo T. Yamamoto)

not. They are rather timid creatures, preferring to run away quickly and hide. They do not "attack" humans. Whenever someon is bitten by a spider it is by accident: the spider was trapped and almost crushed, therefore it defended itself by biting what it considered to be an attacker.

The only North American species known to produce a violent reaction in humans is the famous Black Widow (Latrodectus) found in the western and southern United States and the southernmost parts of British Columbia, Alberta and Ontario. But the effects of this poison on a healthy person will wear off after several (up to 48) very unpleasant hours.

The much dreaded Tarantula (remember "Dr. No" and those horror moves?) is really a large, hairy and relatively harmless spider. There are actually 300 species of Tarantula, all found in the tropics and subtropics, and only a very few found in South America and the West Indies have ever produced any ill effects in man. None were reported to be fatal. The most to be expected from a bite by this docile type of spider is comparable to the results of a bee sting—a sharp pain with local swelling which soon subsides.

Spiders can be seen outdoors during the summer and fall, and indoors all year around, if you look carefully enough. If you see an eight-legged creature spinning a web, hanging in it, or sitting on it, whether the web be a round orb, flat and sheet-like, a mesh of threads, or another of the diverse types of web — it's probably a spider. But not all spiders spin webs to trap their food. What about the spider who is merely out for an afternoon stroll, or a male looking for a female? Well, first of all, there are those eight legs (to confuse you, he may have lost one or two in a fight), four on either side of the two-part body. Looking a little more closely, you will see a pair of short leg-like

structures, palps, at the anterior end where the numerous eyes are. Beneath the eyes are the fangs. There are usually eight eyes, but some species found in caves are totally blind, and some have two, four or six eyes. Although spiders have numerous eyes, they cannot see farther than one or (for those with keen sight) two inches. They rely on discerning movement in some way which is not completely understood.

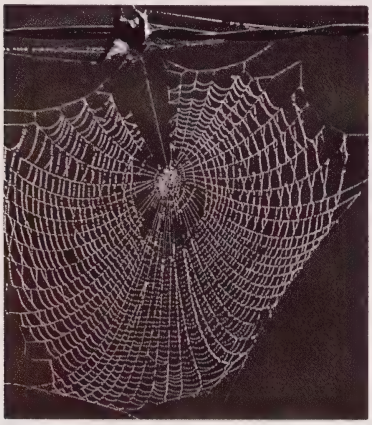
At the posterior end, on the underside of the abdomen, are tiny protuberances — the spinnerets, spouts through which the spider pulls silk. The spider always has a dragline, a thread of silk which it attaches at frequent intervals to whatever surface it is walking on. This safety line supports the spider should it loose its footing, or helps it drop to safety.

Spiders are found almost everywhere, from underground caves to the tops of mountains. A small Jumping Spider was found as high as 22,000 feet on Mount Everest, the highest elevation at which any animal has been taken. Some spiders live in buildings, others on the outside of such structures. Many live in tall trees and shrubs, in leaf litter, under bark, and in numerous other hiding places. One of the Wolf Spiders, named *Geolycosa*, digs a tubular hole in which he remains all his life except when he ventures out to look for a female. The Trapdoor Spider digs a cylindrical hole, luxuriously upholsters it with silk, and builds a silk-hinged door that fits snugly over the entrance. Then, there is Misumena, a Crab Spider almost indistinguishable from the flower in which it sits waiting in ambush for insects. This spider is often coloured like the flower and can change colour to some extent, such as from yellow to white or vice versa. Some spiders mimic ants as a camouflage. Since ants are distasteful to many animals, the spider looking like an ant has less chance of being eaten by the birds, frogs and other amphibians, reptiles, other spiders and various insects that find spiders tasty.

Dependence on silk from egg to adult is the distinguishing feature of spiders. The possession of silk enables them to use a great many cunning and efficient ways of trapping food; to protect themselves during moulting or hibernating; to build sperm webs for mating and to protect the eggs; to travel and disperse and to build nests or retreats; and, of course, to keep that important safety line. Silk is rare in the animal kingdom, and spiders produce six distinct types. The fine threads of silk are a protein similar to that produced by the silkworm, but elastic and strong. A spectacle not to be missed is the spinning of an orb web. Unlike many other webs which grow gradually by accumulation of silk over a period of days, the orb web is completed in one continuous operation

The Crab Spider, who ambushes his prey from his favourite hiding places: flowers. (Photo W.A. Crich)

Below, a dew-laden orb web (photo W.A. Crich). At right, a species of the Crab Spider (photo T. Yamamoto).



lasting between 20 and 50 minutes.

Some spiders "balloon" on silk threads. A ballooning spider climbs to the top of a blade of grass or fence pole or other prominence and, facing the wind, stands on the tips of its "toes," tilts its abdomen upwards and lets out a bit of silk. These threads are caught by wind currents which carry the spider and its parachute to a landing often some distance away. Young spiders use this method to disperse. Silk is also used to make the cocoon for wrapping the eggs. The cocoon can be almost transparent, as that of the delicate Spitting Spider (Scytodes), or quite thick, as that of the Wolf Spider (Lycosa).

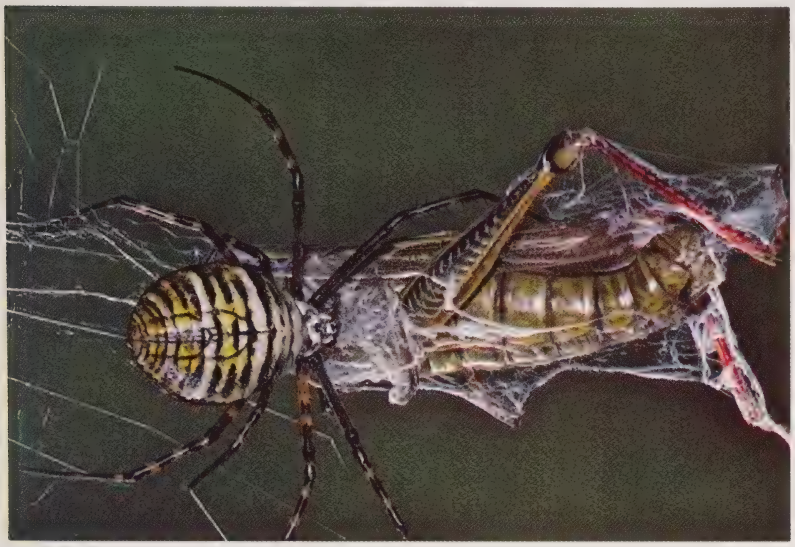
As spiders are found everywhere, so are their eggs: hung in the web, stuck in corners or under bark, on fences, anywhere. The Lycosa carries her egg sac attached to her spinnerets. After her young hatch, they climb onto the back of the mother's abdomen and remain there, dispersing gradually as they become self-supporting, or when their mother dies. Baby spiders are striking replicas of the parent, minus external sex organs, and they are appropriately named spiderlings. They go through a series of moults before attaining adulthood. At each moult the skin is shed, and while the new soft, pliable skin is hardening, the animal expands in size.

Spiders are the only group of animals, apart from man, to make traps to catch their food. The familiar orb web in which the unsuspecting fly, grasshopper or mosquito is caught can be observed in any garden. The Spitting Spider, found only in homes, has a unique method of obtaining its food. It creeps up to within an inch of its prey, then suddenly spits out a gummy secretion through its fangs. The victim is glued to the surface by these sticky threads; when it ceases to struggle, the hunter cautiously walks up and begins to feed. A spider from Australia suspends a thread bearing one or several viscid droplets from one of his forelegs, and begins to spin it as prey approaches. If the prey moves within the radius of this rotating lariat it becomes entangled. Yet another species, from South Africa, builds a small sticky net, about the size of an 8¢ stamp, which it throws over its unwary prey. The delightful jumping spider, the Zebra Spider, is fascinating to watch as he stalks his prey. He, too, creeps up to within a few millimetres and stops. With one giant (for a spider) leap he generally catches his meal. This charming jumper has the ability to twist the anterior part of his body, and often appears to turn around and look playfully at you. He is the only spider that is not timid when humans are around.

Spiders are exclusively carnivorous. As inveterate predators spiders are insatiable, every day consuming literally tons of insects and, happily for us, other invertebrate pests. Some dock spiders have been known to eat small minnows. Spiders are attracted by the movements of the prey and so generally seize only live animals.

The spiders associated with buildings are generally helpful and at least preferable to the pests that they consume. There is only one undesirable aspect of these spiders—cobwebs. The sticky threads of those irregular mesh-like webs found in every corner of the house, or so it sometimes seems, collect dust and dirt,

A Golden Garden Spider feeding on a grasshopper caught in his web. (Photo W.A. Crich)



transforming a shimmering work of art into the nemesis of housekeepers.

When the mating season opens, the male spider goes forth in search of his mate. He has a slight problem to overcome—how to convince the near-sighted lady of his choice that he is not another tasty meal! Since fertilizing the female is his chief reason for living, it is of prime importance that, having survived to maturity and avoided being eaten by the wide variety of animals that prey on spiders, he does not lose his chance. Depending on the species, he may tweak the web in an unmeal-like way, he may run up and embrace her before she can retaliate, he may even present her with some food to ensure her preoccupation. Most remarkable of all, he may dance! This spider dancing consists of rocking from side to side, waving legs or palps, assuming various peculiar (to us) attitudes, and/or moving his abdomen. The dancing varies with the species, but the most elaborate is found in those with keen eyesight. We can safely assume that all this activity on the part of the male convinces the female that it is not dinnertime, and lulls her into accepting his advances. At this point, a popular misconception can be corrected. The male is *not* always killed by the female after mating. This may occur in only a few species and only very rarely—perhaps the female is particularly aggressive and her suitor does not escape in time. In the majority of cases, they separate peaceably but quickly, and the male may even mate again later with the same or other females. The male dies of natural causes soon after mating. The female may die soon after laying the eggs or may survive for several years. Some species tend to live longer than others. Tarantulas may live for up to 30 years, Lycosids (Wolf Spiders) for up to three.

Spiders have fascinated man for millennia. They have been talked about, conjectured on, used as jewellery, good luck charms or beauty preparations; they have been eaten, and are currently being used in research on drugs. And the surprises and secrets of their elaborate Lilliputian world are not jealously guarded—time, patience and a watchful eye are the only keys you need to enjoy them.

Pandora Briant Buckley received her Honours B.Sc. in botany and zoology at the University of West Indies. She joined the ROM's *Department of Entomology and Invertebrate Zoology in 1970, and since then has developed an interest in spiders and in observing them in their natural habitats. She was involved with the survey of spiders found in Toronto homes, carried out by the Department between 1971 and 1973, as well as with the subsequent temporary exhibit, "Along Came a Spider." Among her many departmental activities is the identification of spiders brought in by the general public.*

Underground Worlds of Han China

ROM's Chinese Archaeological Research Team Examines Han Dynasty Burial Practices

Previous page: The Flying Horse (14 inches high), from a tomb in Wuwei County, now the symbol of the touring Chinese exhibition.

Left: second of the three coffins of the Lady Dai; lacquered and painted wood, 7 feet 8 inches long. Right: detail of a banner found in the Mawangdui tomb, showing the Lady Dai leaning on her cane, with her attendants.

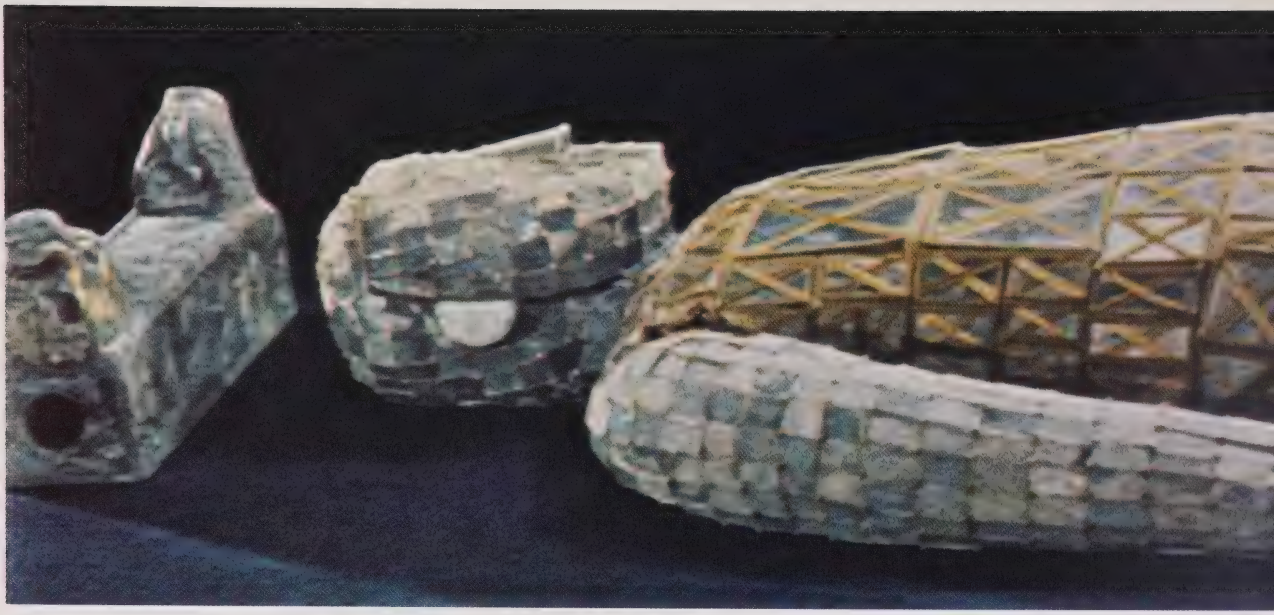
The Han Dynasty in China lasted from 206 B.C. to A.D. 220, and some of the most dramatic recent finds made by Chinese archaeologists have been of tombs of this period, three of which are described in this article. The great underground palaces in which the Prince of Zhongshan and his wife were buried, and the Gansu province tomb have yielded some of the treasures shown in the Chinese exhibition coming to Toronto late next summer, while textiles and lacquerware from the Changsha tomb were recently displayed in Japan.

Comparisons have often been drawn between the Han Empire and that of Rome. Han imperial authority stretched from China across Central Asia to the very frontiers of Europe, and the two empires were linked by busy trade routes. Succeeding the troubled centuries of the Warring States period (475-221 B.C.) and the repressive and revolutionary years of the short-lived Qin Dynasty of the third century B.C., Han unification permitted a growth in general prosperity throughout the nation and a rich, comfortable and stable existence for the upper class.

Life at the time must have been grandly comfortable for those who could afford to live well, and in fact members of the ruling class were so satisfied with their lot that they went to amazing lengths in the pursuit of ways to prolong it indefinitely. Folklore of the period alludes to islands in the eastern sea where immortals supposedly lived in happy possession of the secret of eternal life. Magicians professing to know or to be able to secure this secret enjoyed great favour at the Han imperial court. Ever since Han times the Chinese pharmacopoeia has been distinguished by the inclusion of many formulas recommended for those seeking longevity, among them potent elixirs containing various mineral ingredients. These were usually added for reasons more philosophical than practical. Some of the ingredients in the elixirs, like arsenic and mercury, were so toxic that they may have done more to shorten life than to prolong it.

Less sinister were the methods favoured by the people of Han for preserving the physical body after death. Jade in particular was considered to have a desirable preservative effect, a belief not supported by the unfortunate condition of the surviving remains of individuals of the period, even those who had been buried completely encased in the mineral.

Early in 1972, a tomb mound in Mawangdui in the eastern suburbs of Changsha, Hunan was excavated. The results were spectacular. The occupant of the tomb was in a startling state of preservation. The corpse has been identified on the basis of inscriptions on the funerary objects as the wife of a Marquis of Dai. She died some time within the first half of the 2nd century B.C. The autopsy and X-ray examination have shown that Lady Dai at the time of her death was a plump woman of about 50 with type A blood who had borne children and fractured her right forearm. She suffered from various complaints ranging from whipworm and pinworm through bile stones to coronary atherosclerosis and tuberculosis. She had sixteen teeth and had eaten 138 muskmelon seeds shortly before her sud-

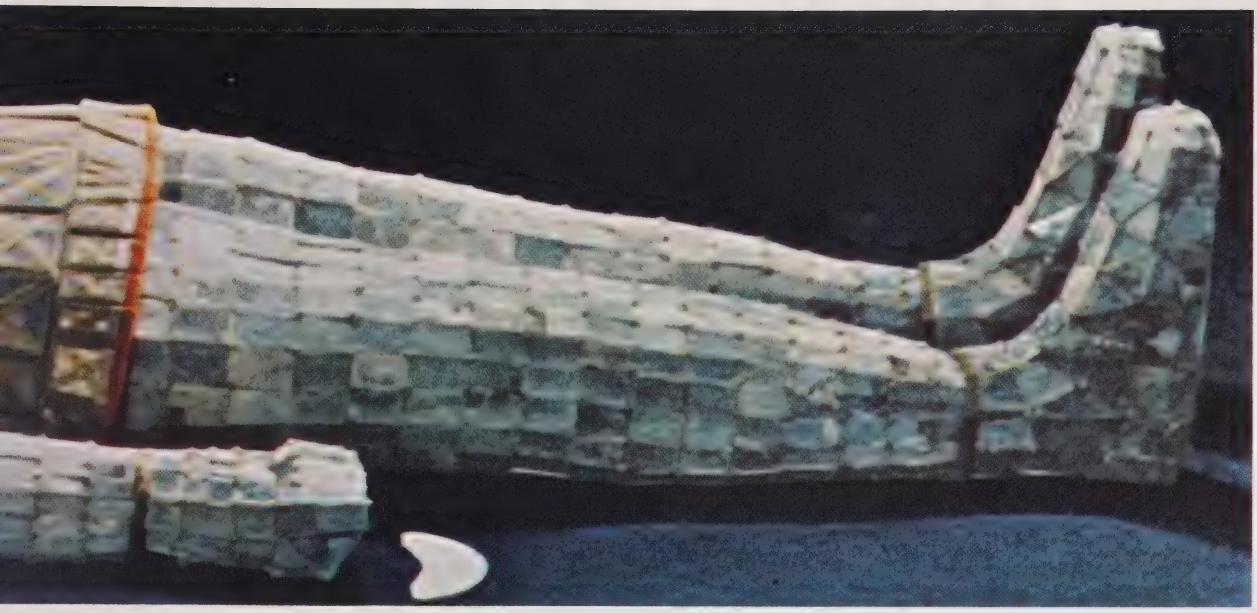


den death, probably from a myocardial infarction or from a serious arrhythmia brought on by a coronary atherosclerotic heart attack caused by bilary colic. The body weighed 75½ pounds and was just under five feet one inch long. Her skin was still moist and much of the soft tissue retained its elasticity. Her skeletal musculature was best preserved, but her brain and internal organs although shrunken were still basically intact. Her sparse brown-black hair was still firmly rooted in her scalp.

The excellent state of preservation of Lady Dai is thought to be due to the hermetic sealing of the tomb and its depth which virtually prevented the entry of oxygen. The chamber was at the bottom of a 52 foot vertical shaft. In it was a massive wooden structure 23 feet long, 16½ feet wide and 9 feet high consisting of three outer coffins, with a space between the two outermost for the arrangement of grave goods, and three lacquered inner coffins. The corpse was wrapped in many layers of silk and linen and immersed in a slightly antiseptic and disinfectant liquid containing several organic acids and a compound of mercury. The seal was effected by placing twenty-six layers of bamboo matting over the structure and then encasing it in over five tons of charcoal, which protected against dampness. This, in turn, was surrounded by a layer of sticky white clay from 2 to just over 4 feet thick. Finally, the shaft was filled with pounded earth and the whole covered by a tumulus over 65 feet in height.

The tomb was sumptuously furnished. From its contents much can be inferred about the comfort of the life of minor aristocrats in the Western Han Dynasty, about the clothes they wore, the food they ate and the servants who waited upon them. One group in the northern storage area is particularly indicative. Twenty-six carved and painted wooden figures, some wearing textile garments, wait to serve a banquet and entertain the guests with song and dance. There are lacquered benches, screens, trays with chopsticks and vessels filled with food, embroidered pillows, scent bags and toilet boxes. But these tell only part of the story of the opulence of Lady Dai's life. The storage areas are filled with a great variety of finely decorated lacquer vessels, some containing remnants of lotus root, chicken, and fish and grain products. Beef, deer, pig, dog and rabbit meat, chicken and birds, eggs, pickled vegetables, sauces, peaches, pears, melons, dried ginger and unhusked rice were found in other containers of pottery and bamboo. Medicinal herbs for the treatment of Lady Dai's heart disease were found in other bamboo boxes. A zither, still with its 25 strings, was thoughtfully included for her entertainment.

The Lady Dai was to be not only fed and entertained after death but also to be clothed. About 50 articles of clothing and another 50 lengths of fabric were found, representing the gamut of textile technology in the early second century B.C. There were plain silks, gauzes, brocades and damasks with designs woven, embroidered and painted in gold and silver dust, including one piece of silk 19 inches wide and 18 inches long weighing less than 1/10 ounce. The most remarkable textile in the assemblage is a large tasselled silk banner found draped over the innermost coffin. It is vigorously painted with scenes from Han life and mythology, including a portrait of the lady herself. In the central panel



is an elegantly dressed woman leaning on a cane and attended by two servants and three other women. The Lady Dai was probably lame. A narrowing of the fourth intervertebral space and a bony excrescence there may well have caused her back and leg pain. But, whatever her pain in life, those who had so thoughtfully and meticulously arranged her burial had made every effort to ensure that she could continue to exist in the manner to which she had become accustomed.

Not a hundred years later, about 850 miles to the northeast in the county of Mancheng (about 100 miles south of Peking), an attempt more costly in time and money but ultimately less successful was made to preserve the bodies of two members of the Han royal family, Liu Sheng and his wife, Dou Wan. Liu Sheng, who died in 113 B.C., was a son of the Emperor Jingdi and elder brother to the famous emperor, Wudi. Dou Wan was the grandniece of Jingdi's mother, the Empress Dowager. Liu Sheng had a reputation as a toper and womanizer which apparently resulted in his exile to the northeast far from the capital in Changan.

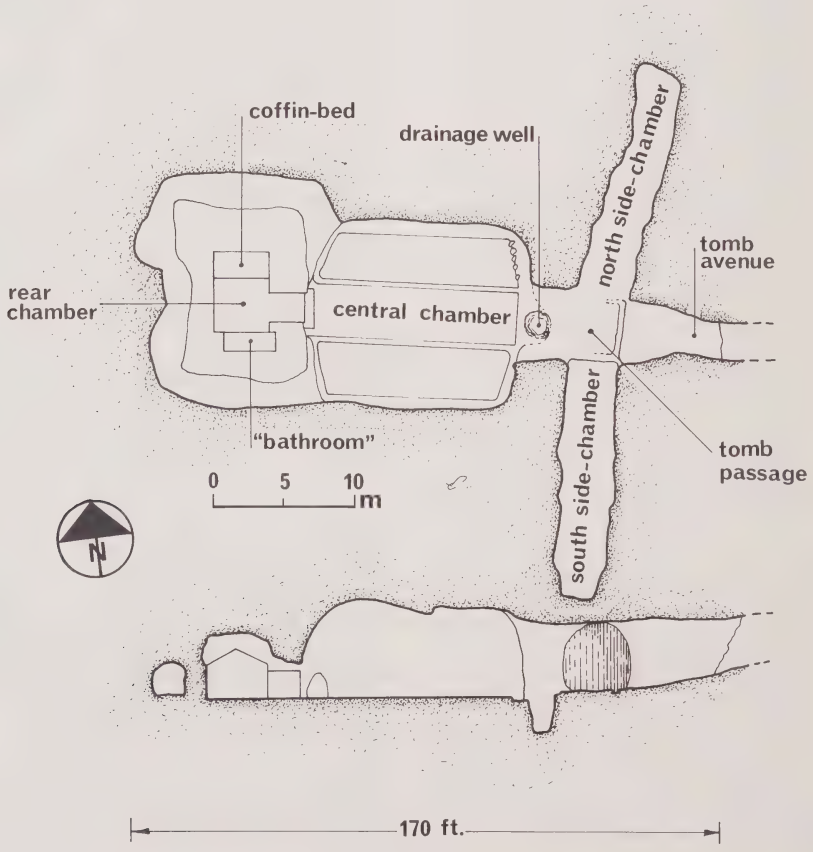
Dou Wan in her jade suit as discovered in Mancheng. Below, a vessel in the shape of a bird from Dou Wan's tomb; bronze inlaid with gold and turquoise, 4½ inches high.

The tombs were discovered in the summer of 1968. The curiosity of some members of the People's Liberation Army was aroused by piles of rocks obviously chipped by hand lying on the slopes of the Lingshan Mountains west of the town of Mancheng. Investigation revealed a tunnel. The soldiers advanced nervously along it, torches in hand, and eventually found themselves in a large chamber filled with incredible treasures. Archaeologists, called in at once from Peking, found the entrance to a second tomb. The plans of the two tombs are essentially the same. Both were sealed by iron "doors" to protect against the depredations of grave robbers. These "doors" were made by pouring molten iron over rocks piled in the entrances to the tombs. A tunnel enters each tomb from the east and on either side of it are long side-chambers. On the west of the main central chamber of Liu Sheng's tomb and on the south of Dou Wan's are the burial chambers themselves, each with a small recess called a "bathroom" because it contained a large bronze basin for water and a small washbasin.

There were over 2,800 objects in the tombs, including a pair of exquisite leopards inlaid with gold and silver and a gilt bronze in the shape of a kneeling serving girl holding a lamp. Both the girl's head and the lamp are detachable and the amount and direction of light emitted can be controlled by rotating sliding panels in the sides of the lamp. In the north-side chambers were placed pottery vessels for cooking and storing food and liquids. The southern chambers held carriages, and skeletons of horses and dogs. The central chambers were filled with a vast array of jades, lacquers, bronzes and pottery vessels and figures of men, women and animals all arranged in neat rows. In the burial chambers were housed the most precious objects, the remants of the coffins and the famous jade burial suits of Liu Sheng and Dou Wan. These suits are made of thin rectangular jade plaques linked together, through tiny holes in the four corners, with gold wire spun from up to thirteen strands. Liu Sheng's suit was tailored from 2,690 pieces of jade and 1,110 carats of gold wire, and Dou Wan's from 2,156 plaques and 703 carats of wire. The front of her coat was made of slightly larger plates held in place by adhesive attaching their binding tapes to a heavy cloth lining. It is estimated that it would have taken an expert jade worker at least ten years to complete one suit.

It is ironic that although Liu Sheng and Dou Wan probably faced death secure in a reassuring belief in the efficacy of jade as a

Ground plan of the tomb of Liu Sheng at Mancheng.



preservative, they were not to last as long as Lady Dai. All that remained of the royal couple in 1968 was one of Dou Wan's teeth.

Lady Dai's tomb chamber was made of wood, and Liu Sheng's and Dou Wan's hollowed from rock, but the Eastern Han tomb of Magistrate Zhang, far to the northwest in Gansu Province, was built of bricks. In October 1969 members of a commune in Wuwei County accidentally rediscovered this tomb. The structure is more complex than that of the two preceding tombs. It is 64 feet in length and consists of a door, an entrance tunnel, an ante-chamber with two side-chambers, a central chamber with a right side-chamber and a rear chamber. The whole is built of blue-grey bricks, some plain and some covered with black pigment, arranged in lozenge patterns. The walls are further decorated with linear designs and lotus and floral patterns in red, yellow, grey and white pigments. Although the tomb has been plundered twice, a wealth of grave goods was left behind. In fact, one wonders how the thieves could have been so negligent. Objects in bronze, iron, pottery, jade, gold and copper remain for the archaeologist to study and the layman to admire. Outstanding are two delicate openwork lamp-stands with 12 and 13 lamps respectively and a gold-inlaid iron umbrella frame complete with movable ribs. The objects are distributed throughout the tomb, the personal belongings in the rear chamber and eating and drinking vessels in the middle chamber. However, the ante-chamber contained the highlight of the tomb, a bronze funeral procession. Similar processions are depicted in wall painting and stone reliefs in other Eastern Han tombs but this is the largest bronze one unearthed to date. It consists of 39 horses, 14 vehicles, 17 warriors and 28 servants arranged in several groups. The figurines are painted in red, white and black with astounding attention to detail. The weaponry, harness and chariots are painstakingly portrayed and provide excellent material for research into these arts. One of the horses has become the symbol of the great exhibition of Chinese archaeological finds coming to Toronto late next summer. It is a spectacular representation of a pacing horse poised on his right hind hoof on the back of a swallow—swifter than a bird in flight.

Many of these figurines are identified with such inscriptions as "A horse and groom for Zhang Na, son of the Magistrate of Zhangyi, Mr. Zhang" indicating that the procession was meant to portray the Governor Zhang, members of his family and his servants and military guard. All that remains today of Mr. Zhang, a magistrate and commander of 1,000 cavalrymen, is part of a leg bone, but the lavishness of his tomb furniture and the pomp of his funeral procession give us an indication of the luxury of his life, albeit in the provinces.

This article resulted from the co-operative efforts of four members of the Chinese Archaeological Research Team of the ROM*'s Far Eastern Department: (from left to right) Sara Irwin, Chin-hsiung Hsü, Patricia Proctor and Greg. Whincup. With Doris Dohrenwend and under the direction of Barbara Stephen, they are making preparations for the exhibition of recent archaeological discoveries from China which will open at the Museum on August 8.*

Funeral banner from Lady Dai's tomb showing the heavens above, man in the centre, and the earth below. Silk, 7 feet 8 inches long.

The Growing Collections

As a result of the successful Starr Miniature Exhibition of last year, a small but fine collection of miniatures is growing quietly and in the shadow of bigger events in the .European Department of the Museum. New acquisitions in this field are (973.335.1) a profile portrait of a young woman, signed Canario, the pseudonym of Luis de la Cruz y Rios, our first Spanish representative of the late 18th century, and (973.335.2) a portrait of a young woman, signed Ritt (Augustin Ritt), which is the first example by a Russian miniaturist in our collection.

Both miniatures are on ivory, and both painters are mentioned and their works recognizably described in Schidlof's work on Continental miniatures. The department gratefully acknowledges the help of Frank D. Lowidt Esq. of Toronto, in the matter of identifying these two miniatures.

A total of 343 specimens have been registered in the Mineralogy collections since the last issue of ROTUNDA, including 15 species new to the collections. Two of these species, ringwoodite and majorite, occur in a specimen of the Catherwood Meteorite, from Saskatchewan, presented by Dr. L.C. Coleman of the University of Saskatchewan. Oosterboschite and trogtalite were presented by Mr. Wm. Pinch, Rochester, New York. Dr. L.J. Cabri of the Mines Branch, Ottawa, presented a newly discovered species, sudburyite, a palladium antimonide, found in the Copper Cliff South Mine in the Sudbury area. Dr. J.J. Brummer, Canadian Occidental Petroleum Ltd., presented a specimen of tugtupite from Greenland.

More than 100 specimens were presented by over 35 individuals, government agencies and private companies, to whom our thanks is extended. Among the more important donations were a series of seven specimens from the Falks Bay Mine, Rainy River District, Ontario, presented by Mr. B. Regensburg, Atikokan, and ten specimens of rare minerals from the Palermo Mine, New Hampshire, presented by Mr. and Mrs. Forrest F. Fogg, Penacook, New Hampshire. A native bismuth specimen from the Northwest Territories was donated by Mr. Brian Weir, Terra Mining and Exploration Ltd., Hay River, and a variety of important specimens was donated by the Ontario Division of Mines, the Mines Branch, Ottawa, Cominco Co. Ltd., Vancouver, DeBeers Industrial Diamonds (Ireland) Ltd., Shannon, Falconbridge Nickel Mines Co. Ltd., Sudbury, and Rio Tinto Co. Ltd., Nerva, Spain. The exchange of minerals with several individuals added a further 60 specimens to our collections.

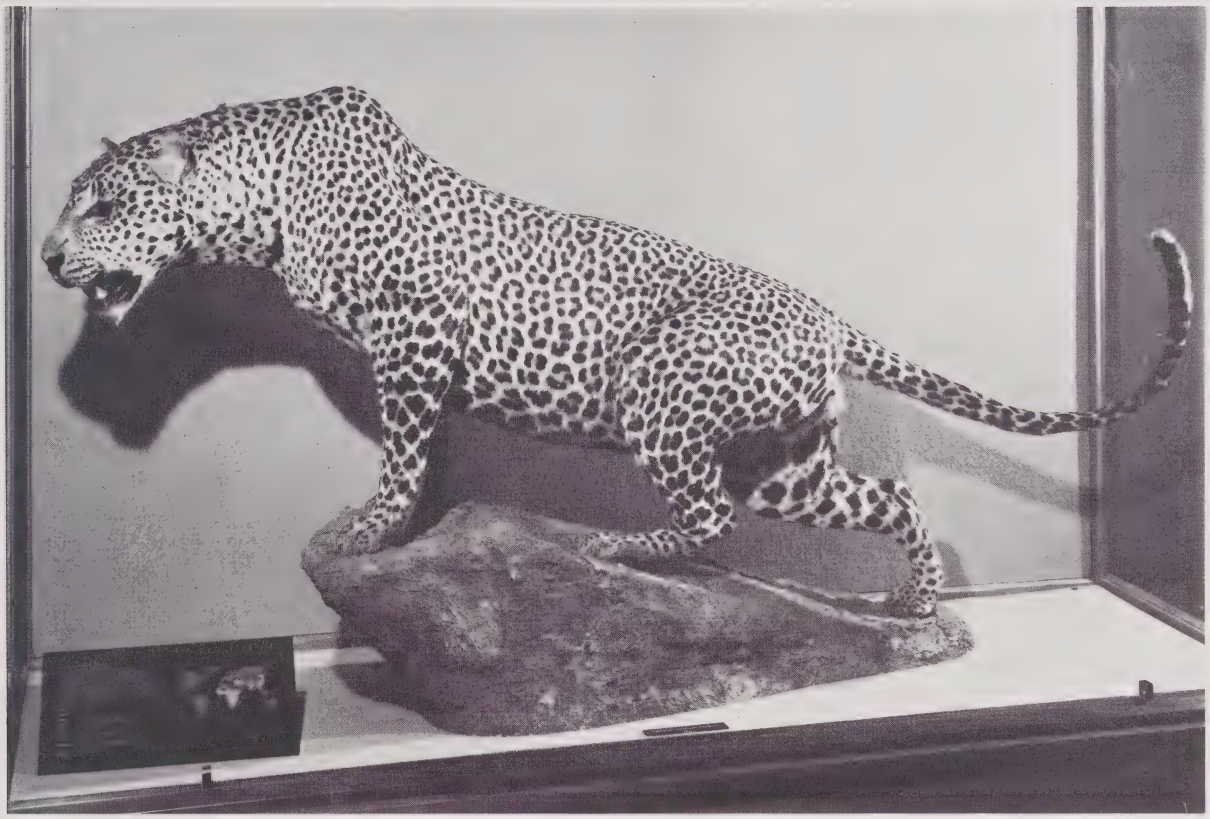
Many purchases were made including a beautiful wulfenite and mimetite specimen, from Mexico, a milarite specimen from Switzerland, an opal triplet from Australia, several scapolite and actinolite specimens, and ilmenite and magnetite specimens from Bancroft, Ontario, as well as several large serandite crystals from St. Hilaire, Quebec. Some of these specimens are now in a special display in the ROM mineral gallery.

The time of Han rule (206 B.C.–A.D. 220) saw China's earliest classical Dynasty and first period of Empire. The ROM's Han collection is rich in funerary arts: glazed and unglazed pottery vessels and tomb figurines, and the large hollow pictorial tiles forming the tomb and lining the walls in Han Gallery III. Except for belthooks and small ornaments, however, there are few luxury objects of metal made for the living. An exquisite bowl acquired this year begins to right this imbalance.

The vessel is small—6 3/8″ (16.2 cm) at its widest and 1 3/4″ (4.5 cm) high. Of cast bronze, it has an almost flush base, rounded sides and a sharply out-angled flat rim. Decorative elements common on Han vessels are the ridged band on the outside of the bowl under the rim, studded with two small animal masks, and the sawtooth borders on the insides. Interest is centred, however, on the rhythmic linear ornament of the delicate allover decoration. This consists mainly of dragon-derived, cloud-like arabesques. Most beautiful of all are the designs in the circular base: a dragon with horned profile head, angular legs and spotted serpentine body in the centre of the interior, and more surprisingly a deer in flying leap in the centre of the underside. Floating circles near the heads of both animals may represent sun and moon.

The preliminary technical observations of Mr. Bernard Leech of the Conservation Department are as interesting as the imagery of the bowl. Under a powerful microscope it is clear that the designs were "drawn" with broken outlines, each segment of which, in teardrop or arrowhead shape, was inlaid with gold. The broader areas of the décor are gilded and silvered. This shimmering surface brightening appears careless or secondary, frequently overlapping the fine outlines. Whether the surface treatment came later than the minute inlaying of the line-segments, or was simply less important in the making, is uncertain.

There is no provenance information for the little bowl, although a small number of vessels and fittings with comparable decoration, none of them scientifically excavated, has been published from collections outside China. Most interesting is the resemblance between our new acquisition and a small bowl with three feet excavated in 1969 from the late Eastern Han tomb at Leitai in Wuwei County, Gansu Province (China's northwest), where the now famous "flying" bronze horse was excavated. Thus, a 2nd or early 3rd century date for the ROM bowl is provisionally given.



The most important Canadian textiles which have been acquired by the Museum this year is a group of coverlets, blankets, quilts and an embroidered tablecloth, all of the 19th century and mostly from Quebec. The weaving illustrates various techniques characteristic of the province including à la planche and boutonné. One of the Quebec quilts is made of brilliantly coloured small pieces of woollen cloth, another from New Brunswick has a charming floral wreath pattern in applied work. In comparison the Quebec tablecloth, which is a rare type, is restrained in both colour and pattern but of excellent workmanship.

This wealth of design and craftsmanship has come into the Museum through the generous donations of Harold Burnham's devoted friends. His scholarship in this field was well recognized by them and his enthusiasm for the subject was infectious. It was therefore felt by his friends in the Textile Department that the most fitting tribute and memorial to him was to use this fund for the enrichment of the great collection of Canadian textiles which had been built up by him. The tablecloth has been given in his memory by the Members' Committee.

An exceptionally large male leopard (ROM 69508) has arrived in the ROM from Kenya, East Africa. A completely prepared mount, this rare example was made available through the courtesy of Mr. W. Roy Kromer of Lyndhurst, Ohio. Since the time the animal was acquired by Mr. Kromer, these beautiful large cats have been placed on the world list of endangered species and attempts are being made to accord them greater protection from over-exploitation. The Museum is fortunate to have this now rare specimen, which is on view in the third floor rotunda area.

Along Came a Spider

Spinning a Special Exhibit

David Barr

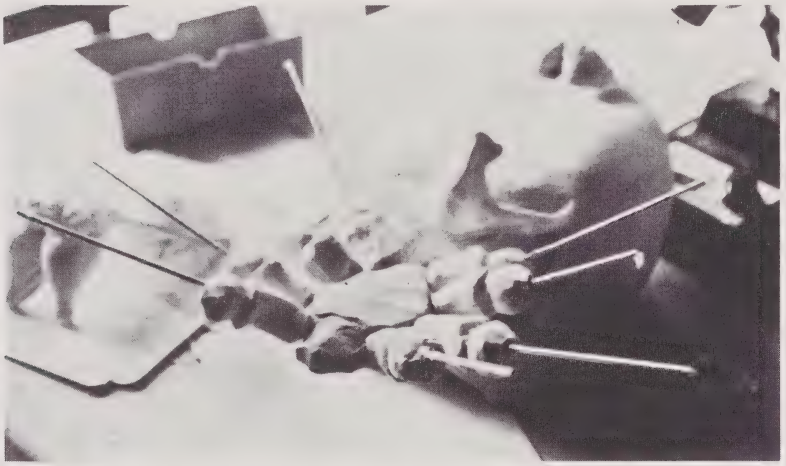
By 11:00 p.m. the evening of September 17, Display Biology's David Pepper was beginning to understand how it must feel to be a spider. He had just spent some two hours climbing from the top of one ladder to another, dragging a long, shimmering skein of twisted polyethylene cord behind him as he wove a giant spider web, suspended in the air over the third floor rotunda display area. Authentic in every detail, the web had to be constructed in exactly the same fashion used by a spider, and Dave was only about half way through discovering how much work was truly involved. Next morning he hung in the web a model he had created of the Golden Garden Spider, some 25 times life size.

The scale model itself had required about 150 hours to complete. The first few days were devoted to a detailed study of preserved spiders with a dissecting microscope. Then, a search for building materials ranged through

The model of the Golden Garden Spider, 25 times life size, after mounting in his artificial web which overhung the area of the spider exhibit.

Facing page: Some of the drawings in the exhibit showing differences between various members of the spider's family.

world
indoors



Stages in the creation of the large model of the Golden Garden Spider. Facing page, the finished product. (Photos David Pepper)

places as dissimilar as a warehouse of balsa wood, cut to all shapes and sizes, and a well-stocked dressmaker's supply. Many items were drawn from Display Biology's inventory of useful bits and pieces: soft, fine leather to recreate the supple membranous sockets where spider leg is joined to body, shaved rabbit pelt for the dense "fur" on the upper side of the cephalothorax, and a variety of hawthorne spines and long, thin insect pins to recreate the forest of sensitive hairs clothing almost every surface of the spider's anatomy.

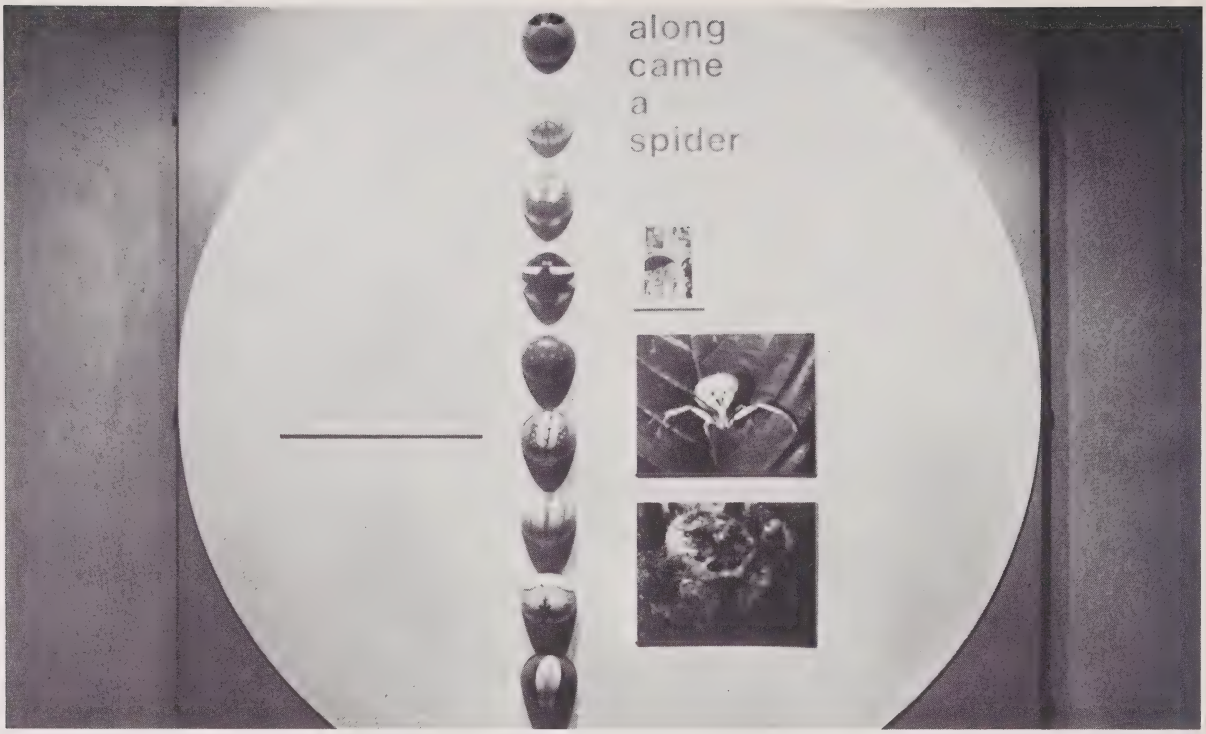
Web and spider were just two components needed in the production of the recent temporary exhibit "Along Came a Spider" (September 18 to October 17). The exhibit was a first for Pandora Buckley and myself, from the Department of Entomology and Invertebrate Zoology. For Dave Pepper and Julian Mulock, also of Display Biology, it was the first Life Science show since completion of the demanding Budongo forest diorama. And for David Lloyd, a recent staff appointment to the Display General department, a central role in the spider show was his first project ever in the ROM.

Perhaps because this show was a new experience and therefore rather important for all of us, we seemed, although frequently uncertain as to which way to go next, to avoid many of the difficulties that have apparently plagued at least some museum exhibit work in the past. We arrived, hopefully, at a show overbalanced neither by design, by unexplained biological detail, nor by excessive scientific content. Certainly all of these problems threatened at some point along the way, and a few did creep through to affect the end result; we are still painfully aware of a number of inadequacies. Yet, by and large, our experience in the centre of things was enjoyable and the resulting exhibit a source of satisfaction.

Could we have been stumbling toward a tentative model for museum display work that has in the past and can in the future produce top quality exhibits of all kinds?

We were fortunate in having involved, almost from the start, three important parties to any Life Sciences display: the appropriate curatorial department, Display Biology, and Display General. The idea for initiating a show should come, ideally, from the curatorial department concerned, but can really be from anywhere inside or outside the museum. Events of the past, however, have demonstrated that a show is doomed to mediocrity unless someone on the curatorial side is enthusiastic about the idea. Once a project is initiated, research, story line, choice of objects and illustrations, and a skeleton physical layout should be put together by the scientific staff. Needless to say, these steps should be carried out just as early as possible, preferably six to eight months before the show is due to open, so that all of the inevitable last-minute problems in finding appropriate materials and having illustrations produced can be accommodated.

Had all planning been left until the end, one important sidelight might have been missed. In the Department of Entomology and Invertebrate Zoology was discovered earlier this year a stack of 40-year-old photographic negatives, each 4″ x 5″ and most of them on glass plates. The photographs were of spiders, taken in the early 1930s by Stanley Harrod, a professional photographer whose interest in arachmids had been stimulated by T.B. Kurata, founder of the Museum's extensive collection of Ontario spiders. From six of these well-preserved negatives the ROM Photography Department produced a series of remarkable, poster-size display prints showing not only dramatic views of spiders but also some behavioural activities for which there are no counterparts in our modern library of colour slides. This made it possible to include an aspect of



the tradition of research on spiders that goes back almost to the beginning of the ROM.

The assembled package of ideas and materials is taken by the curatorial department simultaneously to Display Biology and Display General. Display Biology offers consultation and suggestions concerning visual possibilities of the material. Their staff, usually with a good background in many aspects of animal biology, can often suggest worthwhile simplifications of the story line. Their unique experience with life sciences exhibits will also suggest additional objects for display and ideas on the appropriate physical layout. Display General staff then look at the proposal from an objective and quite properly non-biological basis to offer comments on improved clarification of the story line for the public. And they will also come up with designs for a visually pleasing physical layout, based upon the constraints of exhibit area and scientific message. In this most important area of eye-appeal the designer's opinions usually hold sway. As each of the three departments involved has its own unique expertise and experience to contribute, and each must in its own way have final word on given phases of exhibit design, there must be a flexibility and continual interplay between all three parties at all stages along the way.

For example, the sphere-enclosed mini-dioramas originated from a desire on the part of Pandora Buckley and myself to increase the number of three-dimensional elements of the exhibit. Dave Pepper suggested the house spider micro-habitats as wall-mounted boxes or contained in horizontal cases. We then worked for a while on the idea of mounting each one in a transparent section of a vertical pillar, but it was David Lloyd who transferred the whole group to the south wall and suggested the spherical housing. Dave Pepper then designed each mini-diorama to make most effective use of the globe. The final effect had picked up additional impact at every stage of its metamorphosis.

The rest of the implementation consisted of a series of events, each time initiated by one group, but considered throughout by each of the others as well. Drawings of the layout, wall by wall, and detail of the structures to be built, were prepared by David Lloyd, while Julian Mulock and Dave Pepper began work immediately on the illustrations and models needed. In the Entomology Department, we concentrated on rearing living spiders, preparing freeze-dried specimens, taking spider photographs, and selecting illustrations from books and other sources for exhibit. We always aimed for more than we would need, to allow for selection at the end.

Web collecting, for instance, was a completely new study for both Pandora Buckley and me; one, we learned, in which proficiency is developed only slowly. The essentials are spray-tins of white paint and clear lacquer and

The display at far left greeted visitors to the exhibit, "Along Came A Spider." Left, a close-up view of the painted hemispheres showing stylized patterns and colouring found on the abdomens of spiders.

a whole sheaf of black construction paper. When one discovers a web, the first step is to spray it gently with white paint, etching each tiniest strand in bold relief. Careful attention to the direction of prevailing breezes is a prudent means of preventing the same dazzling transformation of one's hair and clothing. Have you ever spent half an hour scouring white mist off your eyeglasses? Then, if you can manage to bring up a sheet of black paper and fix the web to it with lacquer, without losing your balance and rending the delicate structure beyond repair, you will have obtained a permanent record of one of the finest pieces of craftsmanship produced by any animal.

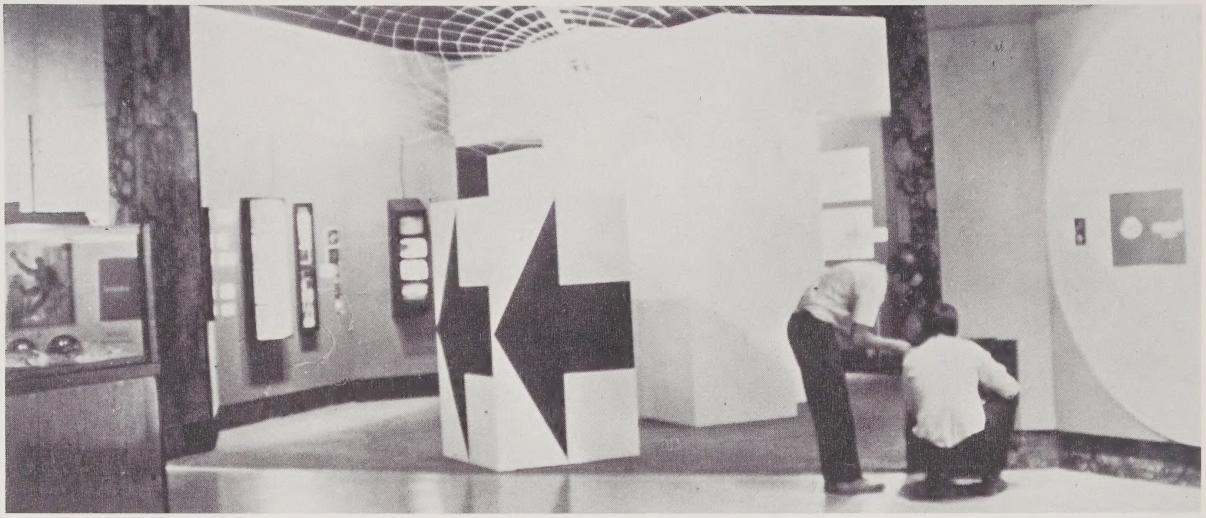
All labels explaining the story line of the show were drafted in Entomology and typed for final display by Judy Allan, the Departmental Secretary. Service departments, such as Carpentry and the Preparators, were contacted by both Display General and Display Biology and alerted for the various aspects of construction and physical erection of the show that would be needed. In addition, of course, much help came from other staff members of the three departments directly involved in the show and, indeed, from apparently unrelated departments (Library, Photography, Ethnology, Far Eastern) as well.

Tosh Yamamoto (Entomology and Invertebrate Zoology), who among his many other activities is our chief spider photographer, contributed a variety of colour shots of exotic spiders and did a special series on several household species. Armed with cameras, bellows, extension tubes, tripod and electronic flash, he has captured magnified views of spider life that show much more than the naked eye can distinguish. And through Tosh's contacts with Dr. Aubrey Crich, a talented amateur photographer, the Museum was able to obtain another fine series of transparencies, many of which were invaluable in the spider exhibit.

Julian Mulock spent hours observing specimens with a dissecting microscope to create six stunningly detailed, colour paintings of household spiders, his first ever of arthropods. He also added larger-than-life reality to a wide variety of components of the show, from silk glands to a poster of Spiderman and even a turn-of-the-century, Beardsley-style rendition of Little Miss Muffet for the elevator poster. Pandora Buckley and David Lloyd both had their work areas transformed into spider workshops, the former with dozens and dozens of living spiders and obscure tomes on spider mythology, the latter with posters, spider photographs and flow charts of the exhibit story line. My own office, a crossroads of sorts for meetings and joint decisions, similarly became more and more cluttered with papers as I attempted to keep track of everything that was going on.

The graphics and labels were mounted by Display General, and the selection and installation of the material between September

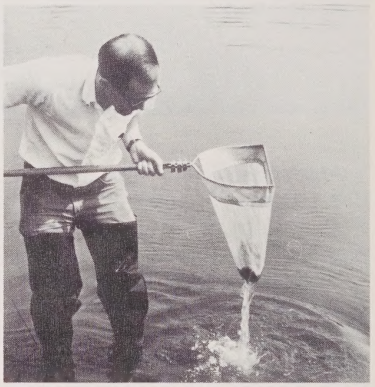
The entrance to the temporary exhibit, in the Third Floor Rotunda.



15 and September 17 involved all of the individuals centrally concerned with the exhibit, as well as several solid days of work by a number of staff members in both the Carpenters' and Preparators' Departments.

What did we learn? Well, we found that display work can indeed be enjoyable, especially when all of the parties involved are enthusiastic, flexible and energetic. We were fortunate during this period in all being excited about the exhibit and eager to see it successful. Inevitably, with certain exhibits this will not always be the case; but it is always necessary that at least one person from one of the three departments involved is vitally interested in the concept of the show, and can act as an overall co-ordinator and a stimulus for the orderly progress of production. We, in the Entomology Department, gained some important new experience in the type of exhibit technique needed for tiny animals. This should be most useful in the new Entomology gallery already in preparation on the third floor, as well as for the much larger planned galleries of invertebrates that will occupy much of our time once museum expansion occurs and increased display space is available. Staff of Display Biology confirmed the many contributions they have to make to all Life Sciences exhibits, a point that has been unavoidably hidden during the several years that they have had to devote to the complex major construction of ecological dioramas. David Lloyd had his first taste of museum exhibit work, and I think all of us were impressed by the important contributions good design has to make in biological as well as any other type of display. We all learned a good deal more about spiders, their lives and habits, and we hope that through our efforts, much of this has been transmitted to museum visitors. Perhaps these fascinating and beneficial creatures can look forward to a slightly better reception in Ontario than heretofore.

The spider show is over now but all our efforts were not lost with its closing. As this article is being written, the exhibit is being redesigned (by the same group that originated it) for transportation and brief exhibit at the Ontario Science Centre. In its new form, it should be available as a travelling exhibit to carry news about spiders to local centres throughout the province.



Although David Barr officially joined the ROM *in 1968, he has been associated with the Museum since 1962 as an undergraduate student assistant in the Department of Entomology and Invertebrate Zoology. Research carried out between 1963 and 1967 led to publication of the Museum's handbook of Ontario crayfishes. In recent years his interests have centred on the classification and evolution of water mites, a delightful group of tiny, colourful, freshwater invertebrates. As an avocation, Dr. Barr writes in a popular vein about creatures without backbones, hoping to introduce to even more people these animals that outnumber all vertebrate species by 9 to 1.*

ROM